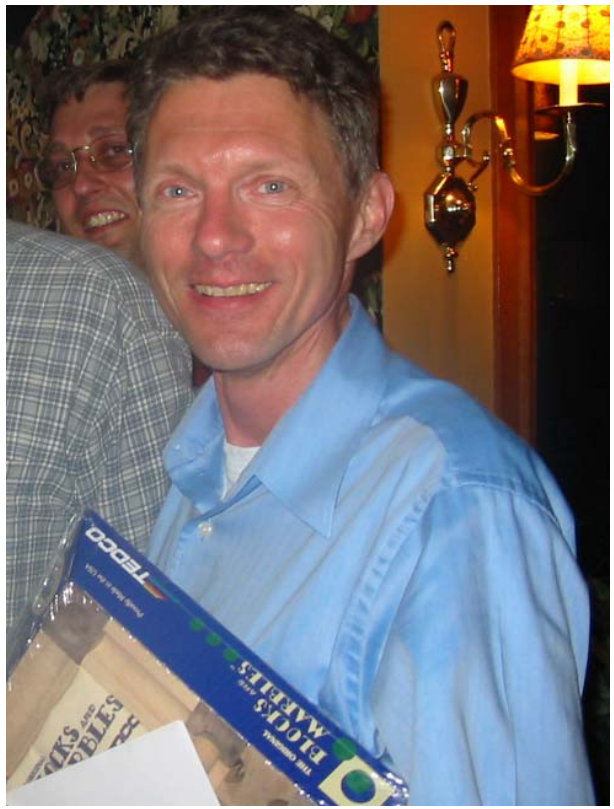
RHIC Ramp Software

(or Life After Johannes, part 2)

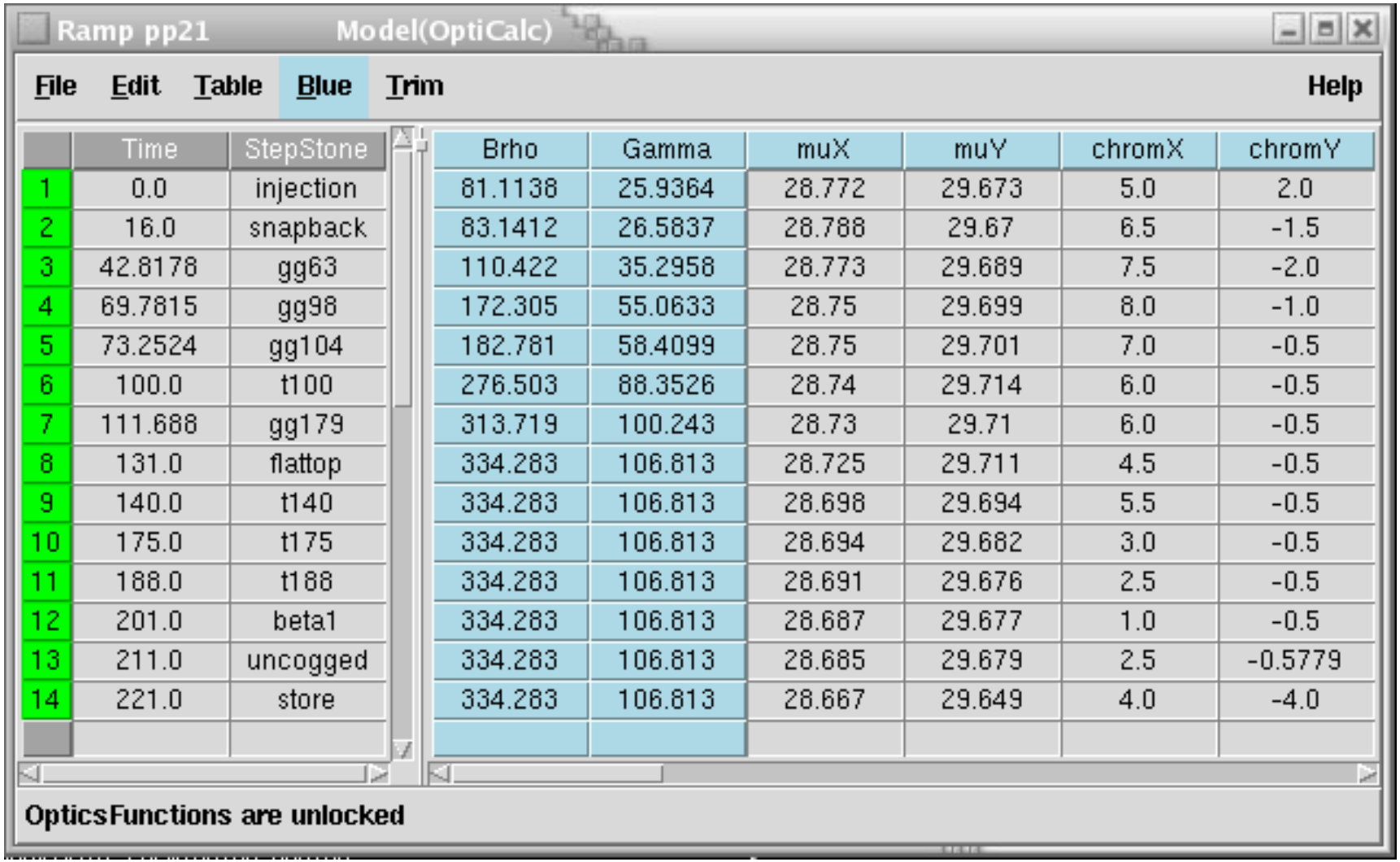
(Steve Tepikian, Al Marusic,Nikolay Malitsky, John Morris, …)

- Ramp System Overview
- Ramp Editor and Ramp Management
- Save / Restore / Compare
- Making Knobs Real
- Configuration Control / Modeling

Modeling ⇨ Nikolay (Fri AM)



Ramp System Architecture



	Time	StepStone	Brho	Gamma	muX	muY	chromX	chromY
1	0.0	injection	81.1138	25.9364	28.772	29.673	5.0	2.0
2	16.0	snapback	83.1412	26.5837	28.788	29.67	6.5	-1.5
3	42.8178	gg63	110.422	35.2958	28.773	29.689	7.5	-2.0
4	69.7815	gg98	172.305	55.0633	28.75	29.699	8.0	-1.0
5	73.2524	gg104	182.781	58.4099	28.75	29.701	7.0	-0.5
6	100.0	t100	276.503	88.3526	28.74	29.714	6.0	-0.5
7	111.688	gg179	313.719	100.243	28.73	29.71	6.0	-0.5
8	131.0	flattop	334.283	106.813	28.725	29.711	4.5	-0.5
9	140.0	t140	334.283	106.813	28.698	29.694	5.5	-0.5
10	175.0	t175	334.283	106.813	28.694	29.682	3.0	-0.5
11	188.0	t188	334.283	106.813	28.691	29.676	2.5	-0.5
12	201.0	beta1	334.283	106.813	28.687	29.677	1.0	-0.5
13	211.0	uncogged	334.283	106.813	28.685	29.679	2.5	-0.5779
14	221.0	store	334.283	106.813	28.667	29.649	4.0	-4.0

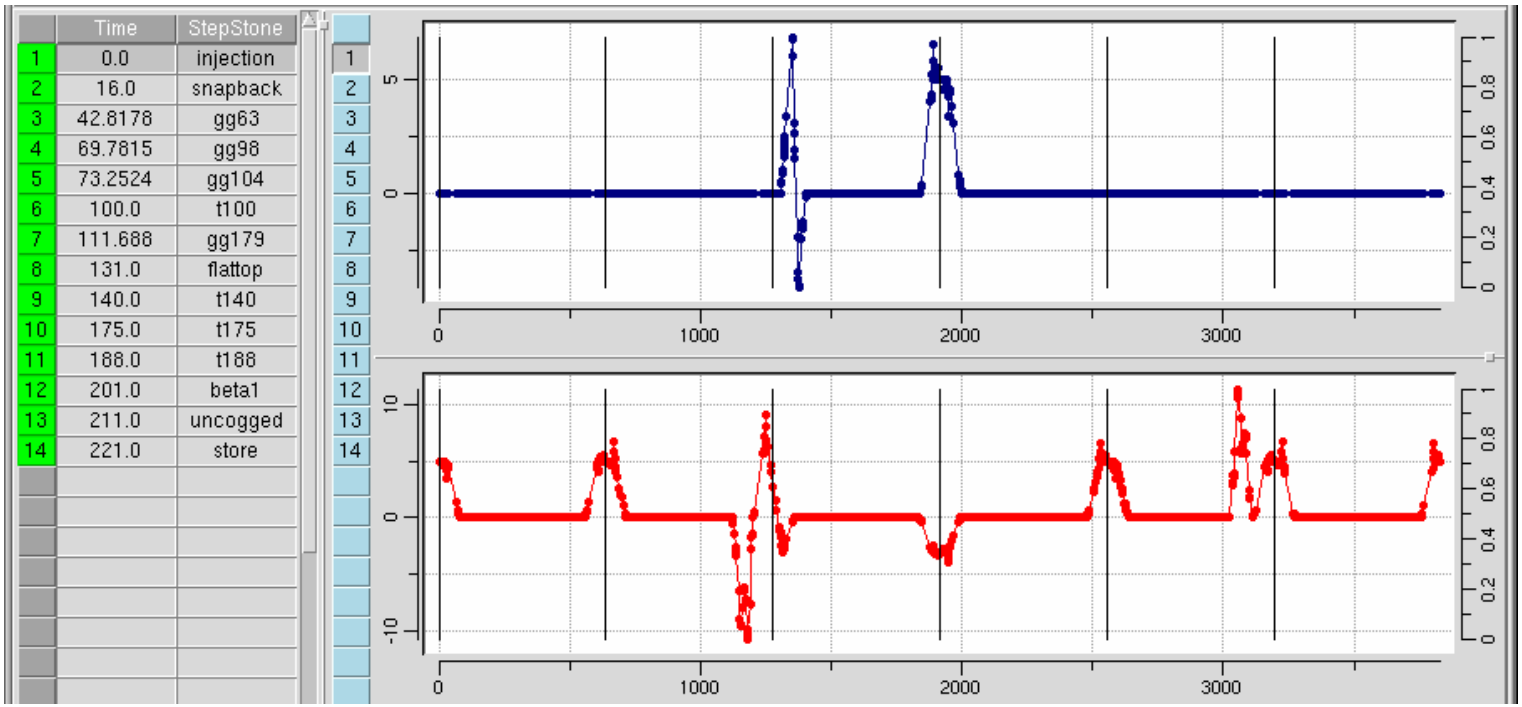
Ramp Editor and Ramp Management I

- The Ramp Editor is always near the top of the Operations complaint list (usually second to Sequencer)
  - Awkward keybindings, cryptic feedback, no undo buffer
  - Entirely written in about 5k lines of semi-decipherable Tcl
  - No resident Tcl experts after Johannes's departure; a few people hack at it for important items, but no ownership.
    - ⇨ Effectively orphaned and unmaintainable; Tcl is a dead-end without organizational commitment

- Recommendation:
  - Rewrite Ramp Editor in C++ (or, egads, Java)
  - Provides more common pet-like table interface, and knobbing
  - 90+% of base functionality should be quickly recoverable
    - Integrate interfaces for RampEditor/wfgman pet page
  - Ramp Editor features: The future RhicInjection?

Ramp Design Orbit

- For >55 bunches, separation bumps are critical
  - Some problems when changing to new optics or setups
  - Ramp Editor should complain of non-zero arc design orbit
  - New ramp OrbStat stripchart for IR BPMs relative to design



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Ramp Editor and Ramp Management II

- Ramp management
  - The current canonical ramp should be driven from configuration control (see Greg Marr's talk), not hard-coded.
    - Also makes standard ramp sequences feasible
    - Latest "golden ramp" too? (But reproducibility issues)
  - Ramp Editor should have at least one level of trivial "undo"
    - Preferably many, or near-trivial time-based restore
  - New ramp preparation needs sanity checking at many levels
    - IBS suppression lattice development example

- Ramp Manager / wfgmanager
  - Eliminate slowness bug when typing tunes/chroms
  - Dynamically optimize slow factors based on applied changes
    - Faster for corrector changes/knobbing
  - Add knobbing ability (see Making Knobs Real)

Save / Restore / Compare

- Every ramp activation is saved as a machine state
  - Only StepStones that have changed are saved
  - Magnet strength settings are saved, not derived values
  - Restore scripts are used routinely (e.g. compramp.tcl)
    - But cumbersome and prone to confusion/failure

- Recommendations:
  - Save tune/chrom setpoints with all StepStones
    - Will allow better tracking, trivial undo/restore/compare
  - Provide Save / Restore / Compare in (improved) Ramp Editor
    - Buffer compare, ramp difference compare (visualization?)
    - Named save states
    - Restore must be reasonably granular (ring, stone, ramp)
    - Include copying stones between ramps
    - How to include RF setup in this? (RFRamps application…)

Making Knobs Real

- Knobs are changes to RHIC that bypass ALL managers
  - Motivation: beam studies and BBA, tune/aperture scans, three- and four-bumps
    - Every change iteration currently takes 5-10 seconds
    - Undoing is as fast as doing (but undo is not always undo…)
  - Even lower-level than wfgmanager "live strengths" interface
  - All changes logged, with safety margins to avoid wild settings
  - Through RTDL, straight to WFGs to control power supplies
    - Examples already exist in Al's secret toolbox (modulation)
  - Non-restorable: can be undone with Ramp Editor activate
    - But changes must be copyable to live ramp
  - May be dangerous to make tuning too easy?

- Recommendation:
  - Develop through next run for tune knobs, single magnet knobs

Configuration Control

- RHIC ramp configuration files are dumps of many database tables to disk
  - RHICgddb tables, magbase tables, atr_gddb..species, …
  - Other ramp-specific files (bstar.sdds, slopes.sdds)
  - Configuration files are mostly static
    - But some things (e.g. magnet data and interpretation thereof) change almost yearly
  - Configuration linked to both ramp and modeling
    - Required to restore old ramps to restore for operations

- Recommendations:
  - Complete with all magnet data from Animesh/MagDiv
  - Investigate systematics affecting tune/chrom/optics

- Get the set tunes and chromaticities right
  - Model optics/gradient errors, few 10^{-4} errors in tune settings
  - Chromaticity/tune settings are inconsistent between rings.

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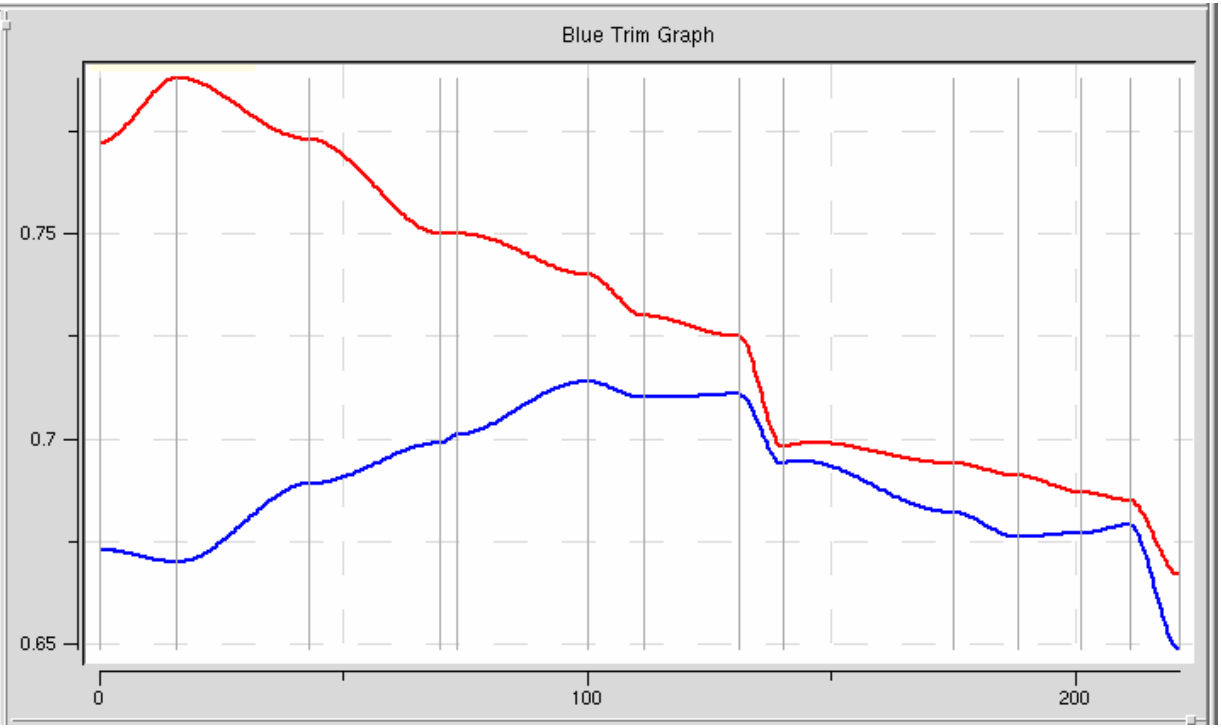
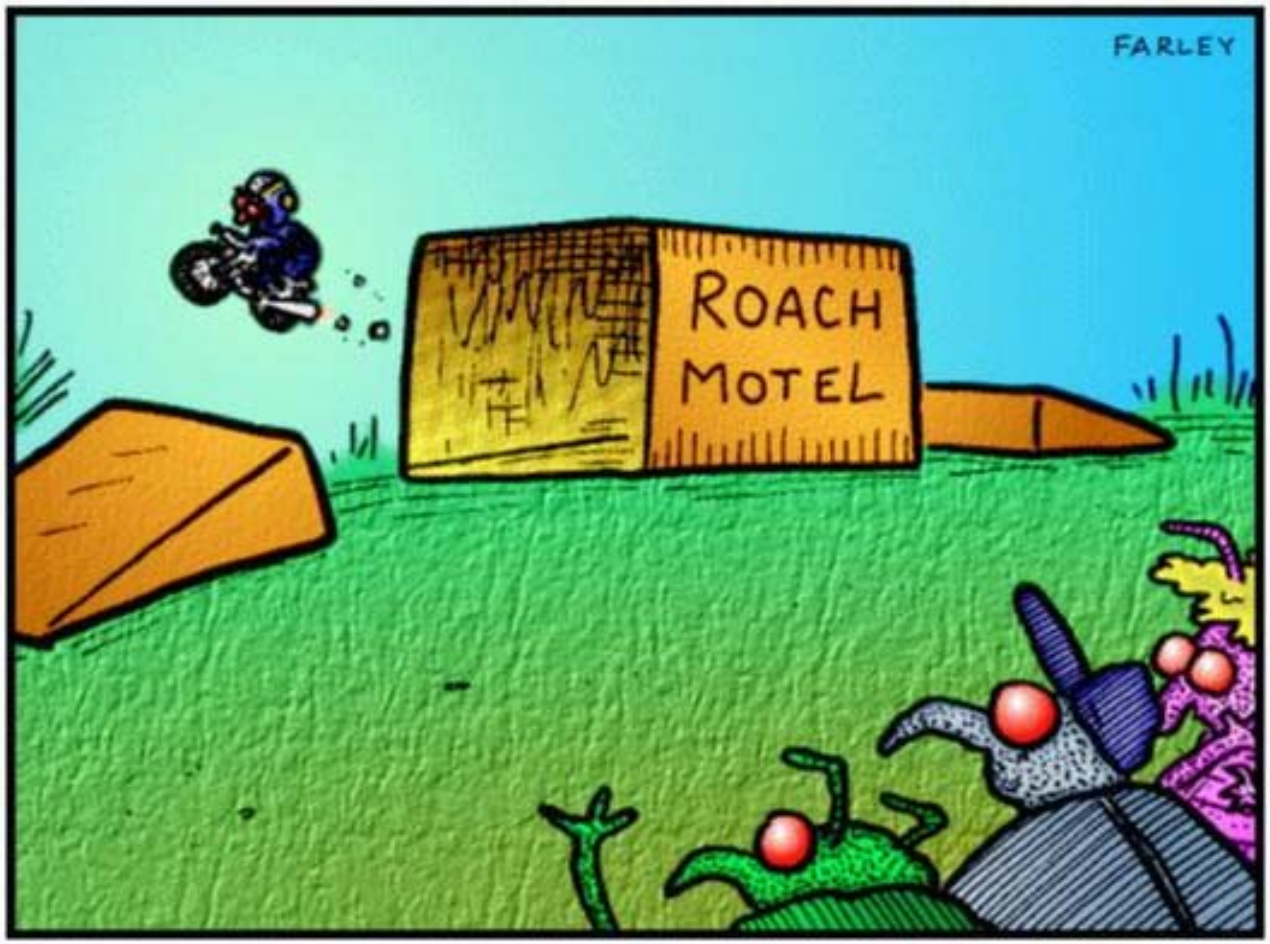


Another Type of Ramp Challenge



Evel KeWeevil thrills the crowds.